

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 13, 2012 has been entered.

### ***Status of Claims***

2. **Claims 1-5, 8-15 and 17-20** are pending.
3. **Claims 6, 7, 16 and 21** are canceled.

### ***Drawings***

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the cavity located in a protuberance of the electrolyte layer of **claim 13** must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure

must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. **Claims 1-5, 8-15 and 17-20** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

**Claim 1** recites the limitation "the first gas" in line 13. There is insufficient antecedent basis for this limitation in the claim.

**Claim 1** recites "the gas inlet dedicated to the second electrode layer for enabling transfer of the first gas through the first electrode layer." It is unclear how a gas inlet dedicated to the second electrode layer can enable gas transfer through the first electrode layer. The gas inlet dedicated to the second electrode layer enables gas transfer through the second electrode layer.

**Claim 1** recites the limitation "the second gas" in line 19. There is insufficient antecedent basis for this limitation in the claim.

**Claim 3** recites the limitation "the first electrolyte layer" in line 4. There is insufficient antecedent basis for this limitation in the claim.

**Claim 3** recites "the gas inlet dedicated to the first [electrode] layer for enabling gas transfer through the second electrode layer." It is unclear how a gas inlet dedicated to the first electrode layer can enable gas transfer through the second electrode layer. The gas inlet dedicated to the first electrode layer enable gas transfer through the first electrode layer.

**Claim 8** recites "two bipolar plates adjacent to each electrode layer." It is unclear if two bipolar plates are adjacent to the first electrode layer and two bipolar plates are adjacent to the second electrode layer or one bipolar plate is adjacent to the first electrode layer and one bipolar plate is adjacent to the second electrode layer.

**Claim 11** recites the limitation "the adjacent layer" in line 3. There is insufficient antecedent basis for this limitation in the claim.

**Claim 12** recites "a non-porous zone." Claim 1, which claim 12 is ultimately dependent, recites "a first non-porous zone." It is unclear if a non-porous zone recited in claim 12 is further limiting a first non-porous zone recited in claim 1.

**Claim 13** recites "a protuberance" in line 2. Claim 1, which claim 13 is ultimately dependent, recites "a protuberance" in line 17. It is unclear if a protuberance recited in claim 13 is further limiting a protuberance recited in claim 1.

**Claim 14** recites "wherein the cavity of the adjacent layer is larger in width and/or in depth than the width and/or height of the protuberance of the bipolar plate." It is unclear if the

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width of the cavity is larger than the width and height of the protuberance or the width of the cavity of is larger than the width of the protuberance and the depth of the cavity is larger than the height of the protuberance.

**Claim 15** recites “a plurality of cavities.” Claim 11, which claim 15 is dependent recites “a cavity.” It is unclear is a plurality of cavities is referring to a cavity recited in claim 11. In other words, is claim 15 claiming that the individual cell comprises a plurality of the cavity recited in claim 11?

**Claim 19** recites the limitation "the anode and the cathode electrode layers" in line 8. There is insufficient antecedent basis for this limitation in the claim.

**Claim 19** recites “a non-porous zone having a thickness equal to the thickness of the anode and cathode layer in a corresponding cell.” It is unclear if a thickness of a non-porous zone is equal to the combined thickness of the anode and cathode layer or a thickness of a non-porous zone is equal to the thickness of one of the anode layer or the cathode layer.

**Claim 20** recites the limitation “wherein the gas inlets for one of the anode and cathode located in non-porous zones of the other anode and cathode.” It is unclear if the gas inlets or the anode and cathode are located in non-porous zones of the other anode and cathode. The Examiner recommends “wherein the gas inlets for one of the anode and cathode *are* located in the non-porous zones of the other anode and cathode.”

**Claims 2, 4, 5, 9, 10, 17 and 18** are ultimately dependent from claim 1 and include all the limitations for claim 1. Claim 4 is dependent from claim 3 and includes all the limitations of claim 3. Claims 9 and 10 are ultimately dependent from claim 8 and include all the limitations of claim 8. Therefore, claims 2, 4, 5, 9, 10, 17 and 18 are also indefinite for failing to particularly

point out and distinctly claim the subject matter which applicant regards as the invention for the reasons listed above with respect to claims 1, 3 and 8.

***Claim Rejections - 35 USC § 103***

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. **Claims 1-5, 8-10, 17 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ruhl (U.S. 4,770,955 A) in view of Omersa (U.S. 2004/0137301 A1) and Itoh (U.S. 2004/0175607 A1).

Regarding **claim 1**, Ruhl discloses an individual cell for a fuel cell comprising:

- a first electrode layer (4) having a first porosity (C4/L42-56);
- a second electrode layer (5) having a second porosity;
- gas inlets (9; 12) dedicated to each of said electrode layers (4; 5) with each gas inlet (9; 12) defining passages (11; 14) within the cell (1) in direct contact with the electrode layer (4; 5) to which each gas inlet is dedicated for enabling gas transfer through the electrode layers (C4/L42-56);
- a solid electrolyte layer (6) located between said first (4) and second electrode layers (5);
- a first non-porous zone (8) located in proximity to the gas inlet (12) dedicated to the second electrode layer (4) for enabling transfer of a second gas through the second electrode layer (5, C4/L42-56); and

- wherein said first non-porous zone (8) forms an internal seal which prevent the mixing of a first gas with the second gas in the first electrode layer (4, C3/L62-C4/L10) thereby creating a self-tight fuel cell architecture (C3/L6-C4/L10).

Ruhl does not explicitly disclose:

- wherein the first electrode layer comprises a first non-porous zone

Omersa discloses a fuel cell comprising a first electrode layer (41) comprising a first non-porous zone (44, Fig. 8) to help create a gas-tight seal with other parts of the fuel cell to prevent unwanted direct combination of oxidant and fuel ([0048]). Ruhl and Itoh are analogous art because they are directed to solid oxide fuel cells. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the first non-porous zone of Ruhl with the first non-porous zone of Omersa in order to help create a gas-tight seal with other parts of the fuel cell to prevent unwanted direct combination of oxidant and fuel.

Modified Ruhl does not explicitly disclose:

- wherein said first non-porous zone comprises a protuberance of the electrolyte layer which extends into the first electrode layer

Itoh discloses a fuel cell comprising a first non-porous zone (8b); wherein said first non-porous zone (8b) comprises a protuberance (8) of an electrolyte layer (3) which extends into a first electrode layer (2) to seal the electrode layer while increasing the strength of the fuel cell stack ([0025]). Ruhl and Itoh are analogous art because they are directed to solid oxide fuel cells. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the first compact zone of modified Ruhl with the protuberance of the electrolyte layer as taught by Itoh in order to increase the strength of the fuel cell stack.

Regarding **claim 2**, modified Ruhl discloses all claim limitations set forth above and further discloses an individual cell for a fuel cell:

- wherein the first electrode layer (4) has a first thickness (Fig. 1) and
- said first non-porous zone (8) has a thickness identical to the first thickness (Fig. 1)

Regarding **claim 3**, modified Ruhl discloses all claim limitations set forth above and further discloses an individual cell for a fuel cell comprising:

- a second non-porous zone (7) in proximity to the gas inlet (9) dedicated to the first electrode layer (4) for enabling gas transfer through the first electrode layer (4, C4/L42-56) to form an internal seal creating a self-tight fuel cell architecture (C3/L6-C4/L10).

Ruhl does not explicitly disclose:

- wherein the second electrode layer comprises a second non-porous zone

Omersa discloses a fuel cell comprising a second electrode layer (42) comprising a second non-porous zone (44, Fig. 8) to help create a gas-tight seal with other parts of the fuel cell to prevent unwanted direct combination of oxidant and fuel ([0048]). Ruhl and Itoh are analogous art because they are directed to solid oxide fuel cells. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the second non-porous zone of Ruhl with the second non-porous zone of Omersa in order to help create a gas-tight seal with other parts of the fuel cell to prevent unwanted direct combination of oxidant and fuel.

Modified Ruhl does not explicitly disclose:

- wherein said second non-porous zone comprises a protuberance of the electrolyte layer which extends into the second electrode layer

Itoh discloses a fuel cell comprising a second non-porous zone (8b); wherein said first non-porous zone (8b) comprises a protuberance (8) of an electrolyte layer (3) which extends into an electrode layer (2) to seal the electrode layer while increasing the strength of the fuel cell stack ([0025]). Ruhl and Itoh are analogous art because they are directed to solid oxide fuel cells. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the second compact zone of modified Ruhl with the protuberance of the electrolyte layer as taught by Itoh in order to increase the strength of the fuel cell stack.

Regarding **claim 4**, modified Ruhl discloses all claim limitations set forth above and further discloses an individual cell for a fuel cell:

- wherein the second electrode layer (5) has a second thickness (Fig. 1), and
- the second non-porous zone (7) has a thickness identical to the second thickness (Fig. 1).

Regarding **claim 5**, modified Ruhl discloses all claim limitations set forth above and further discloses an individual cell for a fuel cell further comprising:

- one bipolar plate (2 or 3) adjacent to the first (4) or second electrode layer (5, Fig. 1).

Regarding **claim 8**, modified Ruhl discloses all claim limitations set forth above and further discloses an individual cell for a fuel cell comprising:

- two bipolar plates (2; 3) adjacent to each electrode (4; 5; Fig. 1)

Regarding **claim 9**, modified Ruhl discloses all claim limitations set forth above and further discloses an individual cell for a fuel cell:

- wherein one bipolar plate (2 or 3) has a coefficient of thermal expansion (C2/L48-C3/L12) higher than the coefficient of thermal expansion of the adjacent electrode layer (4 or 5) and the electrolyte layer (6, C3/L43-C4/L32).

Regarding **claim 10**, modified Ruhl discloses all claim limitations set forth above and further discloses an individual cell for a fuel cell:

- wherein the one bipolar plate (2 or 3) is connected to the adjacent electrode layer (4 or 5) by nesting (Figs. 1 and 3, C2/L48-C3/L12).

Regarding **claim 17**, modified Ruhl discloses all claim limitations set forth above and further discloses a fuel cell comprising:

- a stack of cells (20),
- each cell being separated from its neighbor by a bipolar plate (2 or 3, Figs. 1 and 3).

Regarding **claim 18**, modified Ruhl discloses all claim limitations set forth above and further discloses a fuel cell:

- with a circular plane geometry (Fig. 2)

#### *Allowable Subject Matter*

9. **Claims 11-15** would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

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10. **Claims 19 and 20** would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

11. The following is a statement of reasons for the indication of allowable subject matter:

12. The closest prior art of record is Ruhl (U.S. 4,770,955 A) in view of Omersa (U.S. 2004/0137301 A1) and Itoh (U.S. 2004/0175607 A1).

Ruhl discloses an individual cell for a fuel cell comprising a first electrode layer (4) having a first porosity (C4/L42-56); a second electrode layer (5) having a second porosity; gas inlets (9; 12) dedicated to each of said electrode layers (4; 5) with each gas inlet (9; 12) defining passages (11; 14) within the cell (1) in direct contact with the electrode layer (4; 5) to which each gas inlet is dedicated for enabling gas transfer through the electrode layers (C4/L42-56); a solid electrolyte layer (6) located between said first (4) and second electrode layers (5); a first non-porous zone (8) located in proximity to the gas inlet (12) dedicated to the second electrode layer (4) for enabling transfer of a second gas through the second electrode layer (5, C4/L42-56); wherein said first non-porous zone (8) forms an internal seal which prevent the mixing of a first gas with the second gas in the first electrode layer (4, C3/L62-C4/L10) thereby creating a self-tight fuel cell architecture (C3/L6-C4/L10); the individual cell further comprising one bipolar plate (2 or 3) adjacent to the first (4) or second electrode layer (5, Fig. 1); wherein one bipolar plate (2 or 3) has a coefficient of thermal expansion (C2/L48-C3/L12) higher than the coefficient of thermal expansion of the adjacent electrode layer (4 or 5) and the electrolyte layer (6, C3/L43-C4/L32); and wherein the one bipolar plate (2 or 3) is connected to the adjacent electrode layer (4 or 5) by nesting (Figs. 1 and 3, C2/L48-C3/L12).

Ruhl does not explicitly disclose wherein the first electrode layer comprises a first non-porous zone. Omersa discloses a fuel cell comprising a first electrode layer (41) comprising a first non-porous zone (44, Fig. 8) to help create a gas-tight seal with other parts of the fuel cell to prevent unwanted direct combination of oxidant and fuel ([0048]). Ruhl and Itoh are analogous art because they are directed to solid oxide fuel cells. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the first non-porous zone of Ruhl with the first non-porous zone of Omersa in order to help create a gas-tight seal with other parts of the fuel cell to prevent unwanted direct combination of oxidant and fuel.

Modified Ruhl does not explicitly disclose wherein said first non-porous zone comprises a protuberance of the electrolyte layer which extends into the first electrode layer. Itoh discloses a fuel cell comprising a first non-porous zone (8b); wherein said first non-porous zone (8b) comprises a protuberance (8) of an electrolyte layer (3) which extends into a first electrode layer (2) to seal the electrode layer while increasing the strength of the fuel cell stack ([0025]). Ruhl and Itoh are analogous art because they are directed to solid oxide fuel cells. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the first compact zone of modified Ruhl with the protuberance of the electrolyte layer as taught by Itoh in order to increase the strength of the fuel cell stack.

Ruhl, Omersa and Itoh do not disclose, teach or suggest the following distinguishing feature(s):

An individual cell for a fuel cell comprising a protuberance of the bipolar plate, said protuberance of the bipolar plate fitting into a cavity in a compact zone of the adjacent layer.

***Response to Arguments***

13. Applicant's arguments with respect to **claims 1-5, 8-15 and 17-20** have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sean P. Cullen, Ph.D. whose telephone number is (571)270-1251. The examiner can normally be reached on Monday thru Thursday 6:30 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on 571-272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. P. C./  
Examiner, Art Unit 1725

/Basia Ridley/  
Supervisory Patent Examiner, Art Unit 1725